

ANALYSIS OF MAMMOTH CAVE PRE-PARK COMMUNITIES

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Matthew Brunt

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Date Recommended 12/4/09

Dr. Katie Algeo, Director of Thesis

Dr. Stuart Foster

Dr. Joshua Durkee

Kevin Cary

Dean, Graduate Studies and Research Date

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Directed by: Dr. Katie Algeo

Department of Geography and Geology

Western Kentucky University

Before the creation of Mammoth Cave National Park, this area was home to numerous communities, each with a sense of identity. To prepare for the creation of the National Park, all residents living within these communities were relocated, and many of these communities were lost to the passage of time. Today, public memory of these lost communities is being fostered by the descendents of the pre-park area.

Through the use of a Historical Geographic Information System, 1920 Edmonson County manuscript census data, and statistical analysis, the demographic composition of these lost communities was explored. This project not only brought to light a past that is not well known, but also built interest in sustaining public memory of the Mammoth Cave pre-park area through the use of historical GIS and public participation.

Introduction

Many visitors to Mammoth Cave National Park do not give much thought to the history of the park. They are not exposed to the full history of this region, a history that has been tumultuous, and which has never been fully brought to light. This research project delves into the history of the Mammoth Cave region, a region that has had much of its history pushed aside. What *was* the pre-park Mammoth Cave area like? More importantly, how (both culturally and demographically) were the communities within this region constructed?

Although it is easy to think of the Mammoth Cave National Park as a once uninhabited space that was molded into a national park, the truth is very different. During the late 17th and early 18th century, Mammoth Cave and the surrounding area, known as the Green River Basin, was frequently used by the French as a hunting ground. French hunters traveled by water, and performed most of their hunting close to streams and rivers. It was during this time that the Green River was known as the Buffalo River, due to the abundance of buffalo and deer that were found along its shores (Warnell, 1997).

During the early-to-mid 1700s, settlers started moving into the Green River Basin. Surnames such as Demonbreun, Skaggs, and Walden were used by these settlers, names (or variation of names) which still to this day can be found throughout south central Kentucky (Warnell, 1997). As time progressed, communities began to develop throughout the Mammoth Cave area. These communities possessed a sense of identity and were agrarian in nature, typical of frontier communities of the time period. Churches

and schools were at the center of these communities, and many residents were of strong Christian faith. By the late 19th and early 20th centuries, these communities had grown. Their residents adopted semi-subsistence practices, and small scale or cottage industries were predominant throughout the area. It was only after the turn of the 20th century that the situation started to change substantially.

Also during the early 20th century the United States Congress started to focus their attention on the protection of watersheds, along with the protection of land from erosion. Both of these factors were arguments used to promote the idea of national parks within the eastern portions of the U.S. The main problem that would come with the creation of an eastern national park was the fact that much of the land east of the Mississippi River was occupied. Unlike national parks in the western U.S., which were carved out of government-owned land, an eastern national park would have to be created from privately owned land. This turned out to be the case with Mammoth Cave National Park. Toward the end of the 1920s, land was acquired from private land owners across the Green River Basin, in preparation for the creation of Mammoth Cave National Park. Most of these acquisitions were voluntary, with an appropriate monetary amount being given to the land owner, but eminent domain was used when necessary.

After selling their land, residents had to move. When such a case arose, which was rare, a court summons was sent to the said individual. While the land owner traveled to and from court, a crew was dispatched to dismantle the house in question to a point that it would be inhospitable upon the land owner's return. When all relocations had taken place, all structures (houses, barns, outhouses, pig styles, fences, etc.) within the

Mammoth Cave National Park area were dismantled. The land was then transformed into what it is today; mainly through tree-planting, so that the Mammoth Cave area more accurately matched the popular image of a national park.

The actions taken in the Mammoth Cave region directly influenced a strong sense of public memory among those displaced. Simply defined, public memory is a set of ‘memories’ shared by a group and/or culture that are passed from generation to generation, usually through oral histories. Often public memory associated with “lost places” is idealized (Hoelscher & Alderman, 2004), with this idealization helping to create a commonality between individuals and/or groups. Descendents of pre-park communities have created their own form of public memory: many of these individuals participate in genealogical groups and annual homecomings. An example of this public memory is the annual Mammoth Cave Homecoming, which is held each year on July 4th. Descendents congregate and share photographs, stories, and other genealogical information. Through these homecomings, an idealized image of pre-park Mammoth Cave is created and sustained, since much, if not all of the emotional pain associated with the relocations has since passed.

Historical Geographic Information System (HGIS) shows potential for adding a critical dimension to the preservation of public memory. Unlike a GIS, which deals with mostly current data, a HGIS uses historical data to recreate past landscapes. These landscapes are constructed using any information that has survived, such as census data. HGIS can be used to encompass any discipline. For example, the Literary Atlas of Europe (http://www.literaturatlas.eu/index_en.html, 2007), which “makes visible the

multiple relationships between real and imaginary geographies, and adequately represents the spaces of fiction” (A Literary Atlas of Europe, 2007). Through the use of a historical GIS, this study helped to show the changing literary patterns throughout European history.

As part of my research project, I constructed a HGIS to provide a geographically-linked database of pre-park communities within the Mammoth Cave region. By creating a HGIS, the goal of this study is to provide an accurate and thorough analysis of the communities that were once scattered across Mammoth Cave National Park. Attention will also be given to public memory and its role as a valuable research resource. Most of all, a piece of Mammoth Cave history will be brought to light, contributing to the remembrance of the pre-park communities and allowing for a more comprehensive view of this region.

For this project, there are three distinct outcomes. The first, and most important, is the creation of a historical GIS of the Mammoth Cave National Park area, circa 1920. This historical GIS will contain road, land tract, and house (or residence) layers. The attribute data will be derived from the 1920 census, allowing the GIS to serve as the base for an expanded historical GIS containing more data from other sources, including photographs, letters, and other documents. By focusing on 1920, this project will be able to show the last snapshot of this region before the relocations were carried out.

Creation of this historical GIS is directly linked to the second outcome, the creation of a methodology for converting manuscript census data to GIS form when the census does not include household address information. With the creation of a

methodology, other census data, such as the 1930s census, can be converted to GIS form, allowing the project to be expanded temporally. This will allow for a more comprehensive view of the relocations that took place in the Mammoth Cave region.

The final outcome is a demographic analysis of the pre-park area, which will provide more information on the family units that composed the communities of the Mammoth Cave region. The project relies on the use of ArcGIS software to create the Mammoth Cave historical GIS, and a combination of ArcGIS® and Excel© will be used to perform the analysis.

This project is seeking to learn more about the communities that were displaced by the creation of Mammoth Cave National Park. What were pre-park family units like demographically? Also, how can the creation of a historical GIS be used for a platform preserving public memory? As the field of historical GIS progresses, how can this technology be applied to the idea of public memory? With the increasing ease of communication across the globe, different applications of public memory will be created. This will ultimately bring about a new era for public memory, as well as historical GIS.

Literature Review

With Geographic Information Systems (GIS) transitioning into various areas of scientific research, there has been much talk of whether GIS should be viewed as a tool, as tool-making, or as a science (Summerby-Murray, 2001). Within the past few years, GIS has started to make a transition from ‘tool’ to ‘science,’ a shift exemplified by Historical GIS (HGIS). Although HGIS started as a quantitative approach to examining the geography and history of place, it has slowly started to encompass qualitative research as well (Gregory et al., 2007).

Difficulties associated with historical research, and how those difficulties are extended to writing about the past, are often stumbling blocks. Historical geographers are often unable to observe the actual phenomenon in question. Instead, historical geographers must treat their research as a crime scene: the action has already taken place, and it is up to the researcher to put the pieces back together, in an attempt to create an accurate representation of the events in question. Unlike natural or social scientists, historical geographers cannot set up “controlled, replicable experiments” (Baker, 232). Alan Baker states “[since] historical geographers cannot observe the past directly; they have instead to rely indirectly on the testimony of witnesses” (Baker, 233).

The momentum gained by historical geography has helped to change the landscape of geography as a whole. Modern geography has become “sensitive to culture as well as space, to the past, and to the changing spatial configuration of power” (Harris, 671). Without understanding the history of a region, a comprehensive analysis of a place cannot be conducted. This also includes understanding the social power structure of a

geographic region. The power structure associated with the pre-park region helps to shed light on the mindset associated with the creation of Mammoth Cave National Park.

Due to the actions having already taken place, the researcher must become more of a historical detective (Baker, 1997). Pieces of the history of a region must be placed together to gain a comprehensive view. This leads to another problem: there will always be missing pieces. Assumptions will always be made, so the totality of a situation cannot be achieved when performing historical research. The researcher must also choose which history to follow. History is often written by those in power, which leads to a one-sided view. This project wants to explore the views of those not in power; the individuals who experienced the relocation first hand and who composed the communities within the pre-park region.

One of the biggest hurdles associated with HGIS is the actual construction of historical databases. Many of these hurdles are discussed by Robert Summerby-Murray, who examines a practical classroom experience while using GIS technology to analyze a project concerning the local heritage landscape of a small town in New Brunswick, Canada (Summerby-Murray, 2001). The current view of GIS is examined, along with its role within the classroom. Summerby-Murray gave students the task of reconstructing the landscape of the town, but left it to them to devise a means of doing so, and his classroom experience was something that had not been attempted before. There was very little information about the town in question, and even less information on how to accomplish the task. Baker's classroom process examined many ideas, including data management, the analytical potential of cartography, and data quality.

Another challenge associated with HGIS is the fact that projects of this kind are based on information that are decades, or even centuries, old. The Great Britain Historical GIS (GBHGIS) is an example. It is “a unique digital collection of information about Britain’s localities as they have changed over time”

(www.port.ac.uk/research/gbhgis, 2009). Similar to the Mammoth Cave National Park project, the GBHGIS uses census data (starting from the 1801 census) in an effort to show the shifting demographic patterns within Great Britain and the British Isles.

The difficulty of constructing and analyzing historical sources comes from the fact that most sources are often imperfect, incomplete, and at times unreliable (Summerby-Murray, 2001). It is up to the researcher to find the most reliable and accurate way to portray historical information while staying as true to the source data as possible. As Murray observes, “data accuracy and spatial identification....was the most difficult, time-consuming and productive aspect of the project as students were challenged to consider that any GIS is only as good as the database to which it is applied” (Summerby-Murray, 42).

Changing census tract boundaries also poses a challenge for those wishing to obtain a comprehensive view of migration patterns within a certain region (Shuurman et al., 2006). Currently this is not a problem for the Mammoth Cave project since it only encompasses a single census year, but if other census years are incorporated at a later date, this will become a difficulty. With each census, district boundaries changed slightly. During one census, a district might extend completely to a river, using the physical feature as a boundary. The next census might move this boundary in accordance with population changes or even physical changes in the land. Changing census district

boundaries are a challenge for a historical geographer, since he/she cannot rely entirely on past boundaries as being applicable to a project. Another problem is the scale of census districts being too large for the analysis. This is the case for the Mammoth Cave project, in which some census districts, such as the Beespring and Brownsville Census Districts, lie partially within the park boundary. When analyzing communities, this can pose a problem. Communities are highly localized entities, and there are many communities that are contained within a single county or even a census tract. This situation makes the use of aggregated census data, such as census tracts, inappropriate since a census tract will contain numerous communities, all with a unique sense of identity.

The key to understanding the shifting of people over space and time is to have spatial data for more than one period of time (Schuurman et al, 2006). Projects such as the National Historical Geographic Information System (NHGIS) are working to alleviate this problem. To date, the project encompasses close to 670 gigabytes of census summary data for the U.S. (Fitch & Ruggles, 2003). Since the geographic units of each census change, this creates a need for a uniform approach to allow for accurate data analysis. The NHGIS was a five-year project, which began in April 2001, and ended in 2006. Using surviving census data from 1790 – 2000, NHGIS worked to create an online, public database, which would put a wealth of knowledge at the fingertips of those who need it (Fitch & Ruggles, 2003). The use of spatial data from different time periods allows for a more nuanced understanding of community structure and change, but due to time limitations, this thesis focused on a single census.

Missing data is a common problem in historical demographic studies. Bennet et. al. (1984) focus on statistical approaches that can be taken to make up for missing data. They observe that there is no systematic approach to obtaining missing data. It is left up to the researcher to devise a method to obtain needed data. The field of historical geography has relied on the best solution for finding missing data, which relies simply on “make the unknown known” (Bennett et. al., 1984, 138), with various methods must be used in order to construct a coherent vision of past landscapes. The issues that arise from missing data are: 1) spatial (only a limited amount of data is obtained for point or area data), 2) temporal (only a sample of a larger time series is available), and 3) deletion process (how/why data is missing). These three aspects must be examined to allow the researcher to conclude what action should be taken to ensure the continuation of a project.

Bennett et. al. go on to provide three solutions which can be applied to missing data. The first is the use of ad hoc methods, including replacing missing data with mean or median data, or discarding the missing data altogether (known as the Fisher-Yates method).

With the Fisher-Yates method, neutral values are used in place of missing data. The second method is cartographic interpolation, in which incomplete data is converted into a continuous data set, and missing data values are estimated from known values. The third solution is the use of statistical methods to make up for lost information, which are split into two categories: distribution-free approaches and distribution-based approaches. Distribution-free approaches use methods such as trend surface models, in which local operators are used to mathematically generalize “the entire surface of the

data in question” (Bennett et. al., 1984, 143) or spatial filters, such as spatial model estimations or the use of methods such as Kriging (which “takes a weighted mean over nearest neighbor distances” (Bennett et. al., 1984, 147), similar to spatial autoregressive processes). With distribution-based approaches, it is assumed that the sample data is drawn from a multivariate distribution of known form but with unknown parameters. Using available data, these parameters are then estimated (Bennett et. al., 1984).

In many cases, maps alone or statistics alone are not sufficient when performing a demographic analysis on a region. Centrography melds maps and statistics to portray central tendency within a geographically distributed population (Sviatlovsky et. al., 1937).

Three main methods are associated with centrography: mean center, median center, and median point. Mean center is a representation of the center of population, and is most beneficial for showing the trends of a population over time. Although not applicable to my work on the Mammoth Cave project, this could be used in a later phase of the project to show the dwindling population trends which were experienced by the Mammoth Cave region in the wake of the park’s creation. Mean center, along with summary circles could be used for the Mammoth Cave Historical GIS to show the spatial distribution of the pre-park population. Median center is a method used to show the point of minimum travel for a region. The median point “is understood to be the point of intersection of two orthogonal lines each of which divides the population into two equal groups” (Sviatlovsky et. al., 1937, 247). It is however characterized as being an erratic and unreliable method, since the parameters for an analysis would be based strictly on the wants of the researcher. There is one main problem with these methods: the somewhat

arbitrary definition of region boundaries. Since regions are defined arbitrarily, and often in a less-than-specific description, an edge effect could be produced, leading to skewed and misleading results about an area in question.

Pierce F. Lewis' (1972) article "Small Town in Pennsylvania" is an exemplar of demographic analysis. It focuses on the demographic and cultural make up of the town of Bellefonte, Pennsylvania, and the changes that occur throughout the 19th and 20th century. At the time of writing, the community of Bellefonte was composed of approximately 6,000 residents, with another 1,000 individuals living up to a mile outside of the city limits. Since the mid 1800s, Bellefonte has experienced a steady depletion of residents. Lewis concluded that for every two people living within Bellefonte at the time of the article, "another one has left town permanently at some time over the last eighty years" (Lewis, 1972, 331). He also found that Bellefonte had a predominantly female population.

The male/female ratio found within the community of Bellefonte was unusual, and some of the factors that could lead to such a situation were examined. Lewis pointed out that many of the males born in Bellefonte sought employment elsewhere. This trend seemed to slow during times of economic hardship whether local or national, such as the Great Depression of the early 20th century or the dwindling supply of coal in and around the Bellefonte area.

An innovative use of GIS is to recover and make more accessible public memory of "lost places." These lost places are often idealized in a sense, but public memory helps to create commonality between individuals. Spaces are often designed to relay certain elements of the past, while encouraging the loss of others (Hoelscher & Alderman, 2004).

This can be seen in the layout of Mammoth Cave National Park, where visitors see no trace of the communities that once populated the area (Algeo, 2007). It should be noted that there are two forms of public memory at work in the Mammoth Cave National Park project: institutional (e.g. government) public memory and communal/collective public memory. The removal of physical reminders of communities within Mammoth Cave National Park was an example of an institutional public memory, reconstituting public perceptions of the area as wilderness. A majority of this project focuses on communal/collective public memory, as it is of more importance in the construction of the Mammoth Cave Historical GIS.

Transforming a place of tragedy into a place of remembrance is a common social use of public memory. Robben Island, located off the coast of South Africa, was once used as a location for exiled political figures, lepers, and (up until the late 20th century) a maximum-security prison. At the start of the 21st century, the South African government took the initiative to turn this location into a historical site, but with much controversy. The government, in essence, was attempting to transform a landmark of suffering and death into a national monument meant to inspire (Hoelscher et. al., 2004). The question must be asked: whose history should be remembered at such a site? Should the inmates, who were the victims in this event, have their story heard? This problem is not country specific. In recent years, the United States and New York City government have encountered much discussion concerning the use of Ground Zero in New York, NY. How does one accurately represent a place of national suffering? It is through public memory that societies can “reclaim” these locations.

As stated by J. Wreford Watson (1983, 385), “it should be an axiom in geography that, ‘People generate prejudice and prejudice governs place’”. This is no different than in regards to public memory and the idea of place. Whether an area is defined by a positive or negative image, both may reflect prejudice. Many public memory projects, such as the ones mentioned previously, are designed to either support or break a prejudice. Many conceptions of place are passed down from generation to generation, with an example being public memory associated with Civil War battle sites. Since there are no more living individuals who experienced the horrors of war firsthand at these locations, the idea of the actions associated with these places has been passed down. In some cases, this has been an oral tradition, while in most cases it comes from a more formal source, such as academia.

The psychology behind such events must also be taken into consideration. Hoelscher and Alderman (2004, 350) state that these “spaces [are] explicitly designed to impart certain elements of the past—and, by definition, to forget others.” In the case of a 9/11 memorial, it must first be decided what to remember and to whom to show respect. The citizens of New York City, as well as the rest of the United States, want to remember the individuals of such an event: the firemen who lost their lives doing their jobs; the regular citizens who risked their lives trying to save fellow New Yorkers; or the thousands of volunteers who left their homes, and risked their lives digging through the rubble of the Twin Towers. As a whole, a society chooses to forget aspects of the atrocities that took place on such locations, while at the same time attempting to remember the individuals affected by such tragedies. Descendants of Mammoth Cave pre-park communities focus their remembrance in a different way than the National Park

Service. Some of the more gritty details of the forced relocations, such as refusal to move by some residents lead to the dismantling of their house to prevent from further habitation, are talked about. It is this willingness to embrace both the positive and negative impacts of the relocations that bring a great deal of depth to the remembrance of the pre-park descendents.

“Man...has a mind and moods that reshape the earth to his own interests and images” (Watson, 1983, 387). In relation to our ambition to reshape the geography of our landscapes and society, public memory draws on this desire to mold areas of interest into something that can be honored in an idealized way. Take Mammoth Cave National Park as an example. The rich culture and history of this area of south central Kentucky has been emphasized by both the state and its residents, and for good reason. This region is unique, and when looked at closely, is a collection of smaller cultural pockets. One aspect of the park that has been obscured is the process behind the creation of the park. The relocations involved with this park are not evident to visitors, but are remembered by former residents and their descendents, although with less bitterness than formerly. The National Park Service, which plays a leading role in interpretation of the landscape, naturally wanted to focus more on positive aspects of the region’s history. Former residents and their descendents, however, preserve their memories of the relocations through their own social networks and gatherings. This does not mean that one group is right and one is wrong, but it simply shows that humans have a tendency to reshape history to accommodate their ideas of the past.

Attention must also be drawn to the effect of the creation of a national park on the people living within the area. These are areas which all had a sense of identity, homes,

livelihoods, and heritage. As human rights started to gain momentum within the United States, as well as the rest of the Western world, the way in which parks were created started to change. Mammoth Cave National Park, for example, was home to approximately 500 families living within established communities. These communities had a sense of identity, and most were reminiscent of late 19th, early 20th century rural American communities, and were centered around churches and schools.

Unlike national parks within the western portion of the United States (Yosemite, Yellowstone, and Grand Canyon), which were carved out of land already owned by the federal government, parks in the eastern portion of the United States were created from privately owned land. National parks located in the western U.S. were created from land that was considered “economically useless,” due to the “lack of exploitable resources, ruggedness of terrain, or distance from processing and manufacturing facilities” (Algeo, 2007, 1). These areas were used by Native American populations, but the federal government showed little concern for these indigenous groups. In the eastern U.S., “clearances were accomplished by voluntary land sales when possible and by use of eminent domain when not” (Algeo, 2007, 2). So, unlike parks within the western U.S. which were already federally owned land, parks within the eastern U.S. were composed of land that was privately owned, and which was ultimately “bought” (or in some cases, taken) from the property owners.

Similar actions were taken in other countries as well. Former Canadian Prime Minister Jean Chrétien (also former Minister of Indian Affairs and Northern Development) stated that “creating national parks sometimes seemed as simple as circling a place on a map” (Barrett, 2003, 46). Little thought was given to the effects

such parks would have on the inhabitants of these regions. Often, the only people living within regions that were to become national parks were the Inuit or other Native American tribes. Therefore, the Canadian government felt, and promoted as fact, that these areas were uninhabited.

This high-handed treatment of indigenous peoples by the Canadian government has been lately tempered. Barrett notes that “today, the government is committed to a complex process of consultation that...has slowed to a glacial pace the process for creating new national parks” (Barrett, 2003, 46-47). Part of the reason Parks Canada currently takes so many precautions when creating a park, can be tied back to the incidents centered around the creation of Ship Harbour National Park in New Brunswick, Canada. In the spring of 1972, the Canadian government and Parks Canada announced the creation of Ship Harbour National Park in an area along the eastern shore of Nova Scotia, an area that was populated with residents and businesses. The government stated that none of the residents would be forced to move, but in the end “94 permanent residences and 167 cottages, along with a few retirement homes and small industries, would need to be expropriated” (Barrett, 2003, 47).

The residents of this area took swift action to promote their disapproval of Ship Harbour National Park, and threatened to use physical force to protect their homesteads. As one newspaper reported, “There are many veterans within the park boundaries who left Canada during the last war to fight for the homes of others. They are prepared, if all else fails, to fight for their own homes” (Barrett, 2003, 47). In the end, the Canadian government gave in to the residents, and the government retracted its plans to create such a park. At the same time, this event prompted Parks Canada and the Canadian

government to change the way new national parks were developed (Barrett, 2003).

Currently they follow a six-step method when creating a new national park:

1. Identify a representative natural area.
2. Select a potential park site.
3. Assess the feasibility of the proposed park.
4. Interim protection is provided for the site.
5. A final agreement is negotiated.
6. Parliament formally approves the park by describing its boundaries in the National Parks Act.

This process often slows down (or stops altogether) at the third step, due to the vast amount of consultation that is provided for each projected park (Barrett, 2003).

Land use rights in both the United States and Canada started to take a parallel course in the late 1970s/early 1980s. Throughout the 20th century, Parks Canada has been more accepting of subsistence living in national parks. It was not until the 1980s that the United States' policy changed. With the establishment of the Alaskan National Interest Lands Conservation Act (ANILCA) in 1980, the U.S. government started to recognize the importance of subsistence living by Native Americans in Alaska. The U.S. National Park Service "recognized the important connection between local rural subsistence users and the land in allowing for a continued opportunity for a subsistence lifestyle by rural Alaskan residents...as long as resources and their habitats [were] maintained in a natural and healthy state"

(<http://www.nps.gov/wrst/parkmgmt/subsistence.htm>, 2006).

The definition of “subsistence” has led to controversy within Parks Canada. Parks Canada requires that Inuit hunters live entirely on the wildlife harvested from their hunting, trapping, and fishing to qualify as someone maintaining the traditional lifestyle, which in turn makes them eligible for wider resource use. Any profit made from selling wildlife products has to go entirely to the maintenance of their subsistence way of life (Stix, 1982). The problem with this definition is that most Inuit living within Northern Labrador have been forced to take part-time work to support themselves. As defined by Parks Canada, these Inuit are not practicing subsistence living, but rather a form of sport hunting, trapping, and fishing. At the same time, Parks Canada promotes the preservation of Inuit traditions. It is this type of ambiguity that has made traditional life for modern day Inuit uncertain.

Another problem that the Inuit face is simply lack of knowledge. Stix (1982) found that a majority of Inuit living in Northern Labrador did not realize there was a battle going on to preserve their traditional ways of life. Without being allowed to sustain the lifestyle that has been passed down for generations, the Inuit subsistence culture could disappear within a few decades.

Natives living in and around national parks in Northern Australia took a different route when national parks were first considered. Unlike the Inuit of Northern Canada, the Aboriginals of Northern Australia were more engaged in the planning process. Aboriginal elders created land-councils for interactions with the Australian government (Gardner et al., 1981). This allowed aboriginals, who might not possess much knowledge on the subject, to appoint representatives who could relay concerns or offer information. These preliminary steps also allowed for “vehicles to be in place to ensure that the

natives would maintain some control over the land, and some input into planning” (Gardner et al., 1981, 211). This control helped to ensure that some traditional living practices could be maintained and used by future generations.

The United States has started to use resident people in creating and running new national parks (an example being Gates of the Arctic in Alaska). These individuals know the land, and also possess a deep-seated knowledge of traditional subsistence living that was used, and is still used, in areas of the world such as this (Gardner et al., 1981). Both the United States and the Australian government understand the benefits that come from employing Native Americans and Aboriginals. These two groups of people have an intimate understanding of the resources available on their native land, and this knowledge is a valuable asset for both park services (Gardner et al., 1981).

A comparison of native land use issues for the United States National Parks Service (NPS), Parks Canada, and Australia’s Northern Territory draws some stark similarities of how national parks are created. All three countries now pay close attention to the rights of aboriginal or native residents. Parks Canada, for example, created “the Yukon Native Brotherhood (1971)...to represent registered Indians of the Territory on land-claims issues” (Gardner, 1981, 208). Australia created the Aboriginal Land Rights Act in 1976, which shows “respect for the Aboriginals’ relationship with the land, the due recognition of Aboriginal title, ‘allowing Aboriginals to use and occupy land in accordance with traditional customs’” (Gardner, 1981, 208). Around the same time (1971), the United States passed the *Alaska Native Claims Settlement Act* which states the following:

In essence, the Act granted Alaska Natives title to 44 million acres of land plus a cash Settlement of nearly a billion dollars, in return for which all further claims to Native Lands in Alaska were extinguished. (Kresge et al., 1977) [Gardner, 1981, 208]

Compared to the Canadian and Australia actions towards natives, the U.S. seems to be less concerned with culture and tradition (Gardner, 1981). The Alaska Native Claims Settlement was a continuation of the process of moving people out of national parks, but the natives being forced to move did receive compensation.

All three countries do allow its native people to participate in subsistence hunting on national park lands, while Parks Canada and Australia allow natives to live on the land. Attention should be given to the fact that, even though all three countries work with natives to help preserve tradition and culture to a certain point, all three have legislation that allow for each country to override any agreement made to natives (Gardner, 1981). Simply stated, national parks, no matter where they are located, are explicitly owned by the government. Therefore, each government has the last say as to what happens on or to this land. This stance echoes the broken promises given to Native American in the United States during the 19th century, but as human rights have progressed, more attention has been given to helping preserve traditional ways of living for natives.

The British government on the other hand, took a different approach to the creation of the English National Forest in the early 1990s. Even though residents were allowed to reside on land within the national forest, this did not mean that there was no debate over its creation. Residing in the English midlands, this forest was created to preserve resources for time of war. In 1919, the Forestry Commission was established to

“ensure a reasonable self-sufficiency of timber in the event of further war” (Cloke et. al., 1996, 556). Unlike past forests, the English National Forest was geared more towards conservation and recreation. Many of the towns which were encompassed by the forest’s 200 square miles were historically known as industrial and mining towns, such as Burton-upon-Trent, Coalville, and Moira. The Forestry Commission was attempting, in a sense, to correct some of the environmental mistakes of the past, and as one resident put it “turn the clock back 50 years” (Cloke et. al., 1996, 561).

As with the creation of Mammoth Cave National Park, the intrusion of big government into the lives of individuals living within the proposed English Forest boundary led to much skepticism. Many felt that this national forest was going to be nothing more than a massive tree farm, where “row upon row of the same type of tree” would be seen. There was also much talk of the tourism industry gaining ground in the area, an idea that led some locals to reject the idea of a national forest. Other concerns were expressed, such as the forest exposing residents to a fire hazard, as well as the woodlands increasing the contact with wildlife, and as the author states “one person’s ‘wildlife’ is another’s ‘vermin’” (Cloke et. al., 1996, 567).

Though there were many concerns in regards to the creation of such a national forest, the Forestry Commission proceeded with its plans. Although critics of the project still exist, the forest as a whole has been seen as a success, and many feel that the environmental benefits of such a national forest will start to show more strongly as the nation progresses into the future (Cloke et. al., 1995).

Mammoth Cave National Park was created during an earlier era than the national parks mentioned above, and the government’s treatment of resident peoples reflected the

times. It should be noted that Mammoth Cave National Park is a valuable addition to both the state of Kentucky and the U.S. National Park Service. It provides a sanctuary for the largest cave system in the world and allows for visitors to see the splendor of such a cave, along with pristine forests. However, something was lost when the park was created. The researcher wants to focus on the unofficial history of the park, and the story that lies within the hearts and minds of those individuals most closely tied to the relocation of pre-park communities.

Although this project is unique, I will draw upon valuable techniques from previous work done in separate fields. My work is informed by the way countries other than the United States have handled the creation of their national parks, and also how these countries have handled their interactions with native peoples. By looking at how university instructors have challenged students to reconstruct community history, I can find valuable techniques to apply to recovering the history of the pre-park Mammoth Cave communities. With manuscript census data being such a large part of this project, a better understanding of census data, along with some problems associated with its use, can help me to confront problems that may arise when working with Mammoth Cave area census data. This project lies at the intersection of historical demography, public memory, and the creation of national park landscapes, and will help to create a more comprehensive understanding of the pre-park region.

Methodology

The centerpiece of this project was the Mammoth Cave National Park Historical GIS. Data used consisted of 1920 manuscript census data and data provided by the GIS staff at Mammoth Cave National Park. This data included the following:

- Road Shapefile: ESRI vector format, line feature.
- 1936 Land Tract Shapefile: ESRI vector format, polygon feature; attribute table included land owner names and land area for each tract.
- Residence Shapefile: ESRI vector format, point feature; attribute table did not include names of residence owners.
- 1980 USGS Topographic Map: Raster file. General reference map showing elevation, streams, modern roads, and some modern structures. Acts as a backdrop and reference for locating houses.

All shapefiles were projected in the NAD 1983 Kentucky State Plane South coordinate system, using U.S. survey feet, with an underlying Lambert Conformal Conic projection (which preserves direction and is equal area). This projection is often used to display smaller regions within the southern portions of Kentucky. Organizational work associated with the data layers that would make up the “Analysis” map document was performed, and consisted of a personal geodatabase using the 1936 land tract, residence, and 1930 road feature classes. Although this portion of the project focused on 1920, the only available land tract data contained only 1936 information. This was problematic at times, because the land tract owners were those who held the land sixteen years after the 1920 census, and ownership may have changed in the intervening period.

The personal geodatabase allowed for a central master file to be used for all digital information pertaining to the project, and this standardized the geospatial data associated with this information (such as a common projection). The use of a personal geodatabase also allowed for a faster and more efficient way of organizing data. Since this portion of the project was only concerned with the Edmonson County area, a county boundary feature class was included in the map documents, to allow for a concrete understanding of the Edmonson County park boundary. Each census district was manually digitized using the census district map obtained from the U.S. Census Bureau in Washington, D.C., as well. The initial goal of the Mammoth Cave Historical GIS was to align manuscript census data with the residence feature class, by matching records for households within the manuscript census with geographic features that represent former house locations within the 1920 pre-park area. This process was complicated by the lack of any geographic location data within the manuscript census. Unlike aggregated census data, which provides tabulated numeric information, manuscript census data consists of the hand-written census sheets completed by the census taker, and contains data on individual households and the individual people living within them. The interests of privacy and federal law dictate that this information cannot be viewed by the public until 72 years after the census in question, since detailed household information, such as names, ages, and occupations of people within the household are found in the manuscript census.

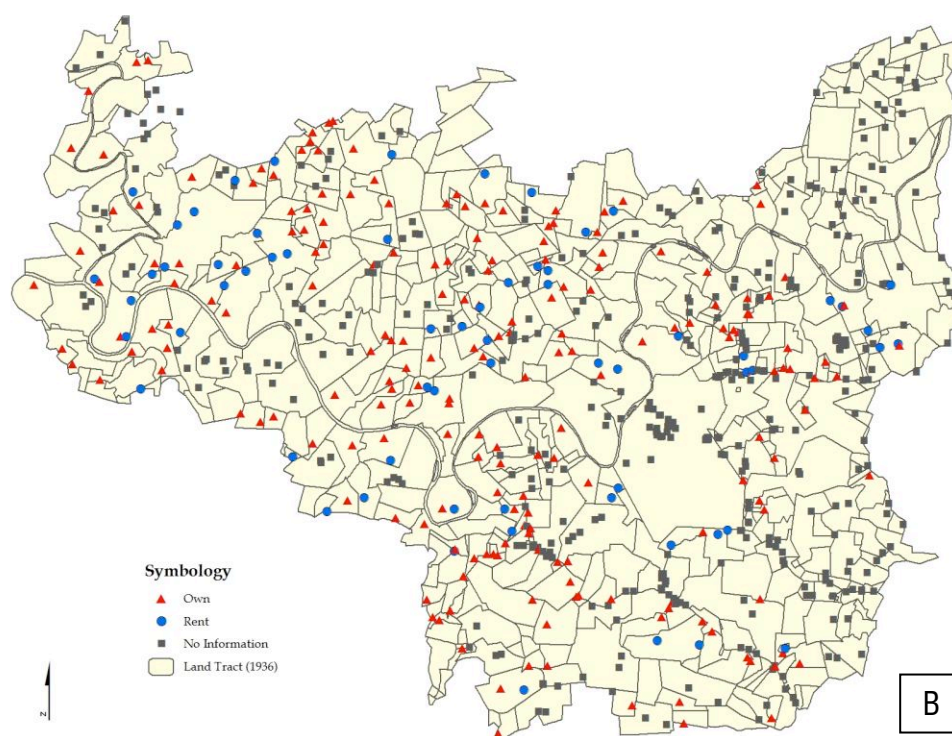


Figure 1A & B: Examples of Analysis Map Document

“Analysis” was the main map document (*.mxd) used for all analytical work associated with the Mammoth Cave Historical GIS. This map document contained all map layers along with the map layout, and examples can be seen in Figures 1A & B. Within this document the spatial analysis was performed, along with work done to populate the attribute table of the residence layer once a match between a census household record and a physical residence had been made. The attribute table is simply a tabular file which contains information about the dataset and is linked to a feature class. The property owner’s name, age, occupation, and own/rent status were added to the attribute table of the former house locations.

Collection of manuscript census information was the first step in creating the historical GIS. A map provided by the U.S. Census Bureau in Washington, D.C., identified the four census districts that covered the area where the future Mammoth Cave National Park would be located. The Green River divided the area, with the Beespring and Fork districts located north of the river and the Brownsville and Parker districts located to its south. These census districts are shown in Figure 2, with an overlay of the Mammoth Cave National Park boundary.

**Mammoth Cave Area Census Districts
Edmonson County, 1920**

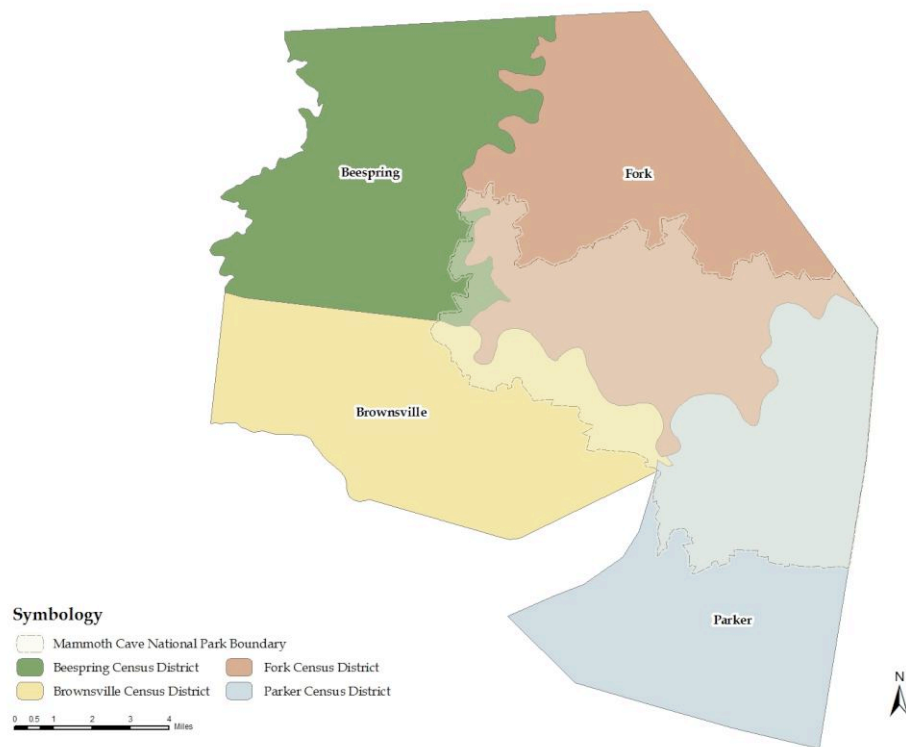


Figure 2: Census Districts

- **Beespring Census District:** encompassed the northwestern area of the park, this census district contained the communities of Sweeden, Grassland, and Goff, and extended to the Nolan River to the east.
- **Brownsville Census District:** located to the south of the Beespring Census District (and containing the southwest portion of the park), this census district contained the Edmonson County seat, Brownsville.
- **Fork Census District:** located directly to the east of the Beespring Census District and north of the Green River, this census district contained the communities of

Ollie and Stockholm. This census district extended from the Nolan River to the Edmonson/Hart County border.

- Parker Census District: located directly to the south of the Fork Census District, this census district encompassed the southeastern portion of the park. The entrance to Mammoth Cave was located within this census district, along with the community of Chaumont.

All Edmonson County manuscript census data was located on microfilm at the Kentucky Library on Western Kentucky University's main campus. The microfilm proved problematic for several reasons. Film quality was variable and some of the microfilm was barely legible due to age or original reproduction techniques. The poor quality of the microfilm machines being used in the library added other frustrations. On a number of occasions, the microfilm readers were broken, and further data collection had to wait until they were repaired. Although setbacks were experienced in the collection of microfilm data, all needed information was finally Xeroxed and obtained.

When collection of the manuscript census information was complete, an index of this information was created. The index included a head of household, household size, age, occupation, manuscript census page, and census district field. In all, four indices were created, with one for each of the four census districts in question.

There were two reasons for creating the manuscript census indices. First, they allowed instant access to the names contained within the manuscript census. They also provide a condensed version of the 1920 census, since only heads of household were listed. More importantly, the manuscript census indices allowed for a digital version that was searchable by name, occupation, age, and/or sex. This helped to greatly streamline

the research phase of the project. If manuscript information was needed for an individual, instant access to needed information was easily obtained. Manuscript census indices also assisted in the process of locating household information when attending homecomings, an integral part of the project used for data gathering from first person participants and/or descendents of those involved in the pre-park relocations.

Although the creation of manuscript census indices were of great importance to the project as a whole, the process was not without complications. Due to the varying degree of quality associated with the manuscript census (whether from the census taker's handwriting or the document's physical quality when transferred to microfilm), there were many instances when it was difficult to transcribe the manuscript census. The most common problem associated with the transcription of information included being unsure of spelling of a name (since many interpretations of surnames were used depending on the census worker). Best judgment was used in determining the correct spelling and the current spelling in use today was often referred to.

After preparing the manuscript census indices, I then sought to align or match the Edmonson County manuscript census with the residences feature class supplied by the U.S. National Park Service. As a first step in matching census households to geographic features representing houses (e.g. placing households on the landscape), I searched through the data provided by the National Park Service to find land parcels which only contained one residence (or former house location). Due to there being no owner information tied to the residence feature class, the names listed within the land tract feature class were to be used to start populating the owner field within the residence feature class. This step was based on a simplifying assumption that the owner of a land

parcel and the head-of-household who was listed in the manuscript census was likely the same individual. These “singleton” houses (which were simply houses where a single house occupied a land parcel) were selected and exported into a new feature class. I then compiled a list of land tract owners whose land tracts contained a singleton house, and the names of those land owners were searched using the manuscript census indices. If these land owners were listed as owners in the manuscript census, their names were associated with the singleton house located on their property.

The assumption was justified because in most cases where a land owner had a single house located on their property, and they were listed as owners in the manuscript census, they would have resided in the singleton house located on their property. A source of error associated with this assumption would be land owners who owned a parcel of land within the pre-park area but actually lived in another part of the state or country. Some individuals were known to own land in Edmonson County, but actually live outside of the pre-park area. These individuals would often rent out any houses which resided on their land. Despite the possibility of this type of error, this simplification assumption was a useful and productive means of starting to pinpoint household locations, and many of the houses matched this way were verified with former park residents during a later phase of the project.

Each household record was also tagged with an attribute value of “owner” or “renter” within the residence feature class. This value indicated whether the owner of a land parcel lived in a house on the parcel, or if the house location was rental property. If I could not definitely attribute a resident-owner to a house through this means (because,

for instance, there were two or more houses located on the parcel), the house was given a renter value.

To maintain quality management with the collected information from key sources as well as public information, a new field was created within the attribute table of the residence feature class. This field, “Res_Src” (or Resident Source), contained six pre-set verification classifications: “One House on Tract; HH Owner”; “Best Guess Based on Interpolation of Known Residents”; “NPS Residences”; “Member of the Public at MC Homecoming”; “Single Residence”; “Key Informant is Very Sure”; and “Key Informant thinks likely”. This allowed for a tracking mechanism to be set into place as to show where each head-of-household assigned to a former house location came from. Through this process, I was able to track the certainty associated with the owner/renter status of houses, while allowing for the information to be double checked against information from other sources. This allowed me to build a base population of 120 residences that were matched with census records.

The next step in the process of aligning the manuscript census with the residence feature class involved using known matches to interpolate manuscript census records based on their order and the hypothesized route of the census taker. I pinpointed certain areas, and created bookmarks within the map document, which contained a high density of residences for which census households had been identified. These household head names were then found within the manuscript census index, and an attempt to align unnamed residences through interpolation was performed. Figures 3A and 3B illustrate this process. If there were two known home owners with a certain number of houses in between, and if the manuscript census contained these two home owners with the same

number of households in between, the “unknown owner” house locations were assigned the names of those heads of households which fell between the known owners within the manuscript census. Since the census taker would have followed the road infrastructure of the time, I was able to use the order of the census information to align names with former house locations. After a number of names were tied to unknown residences, this information was then presented to key informants in an effort to confirm or deny this new location information. After this step was performed, 35% of the residences had associated owner information (totaling approximately 230 former house locations). These house locations were all assigned a value of “Best Guess Based on Interpolation of Known Residents” within the Res_Src field, allowing me to see the origin of this information.

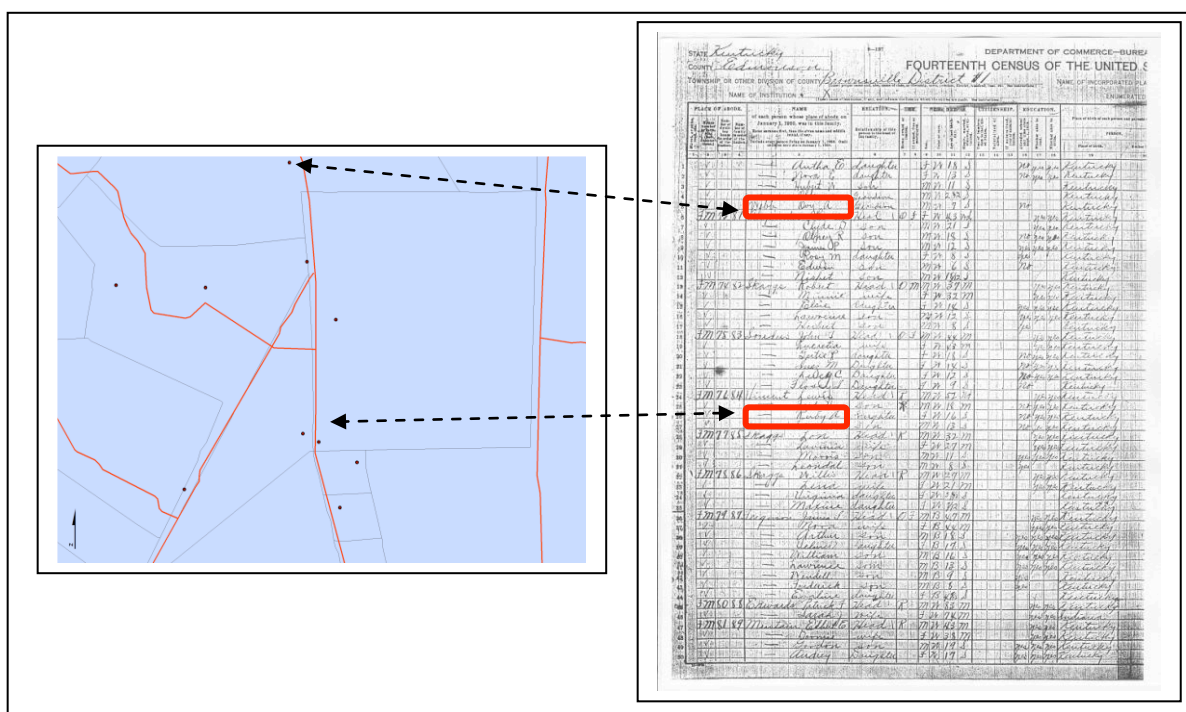


Figure 3A: Example of Census Interpolation

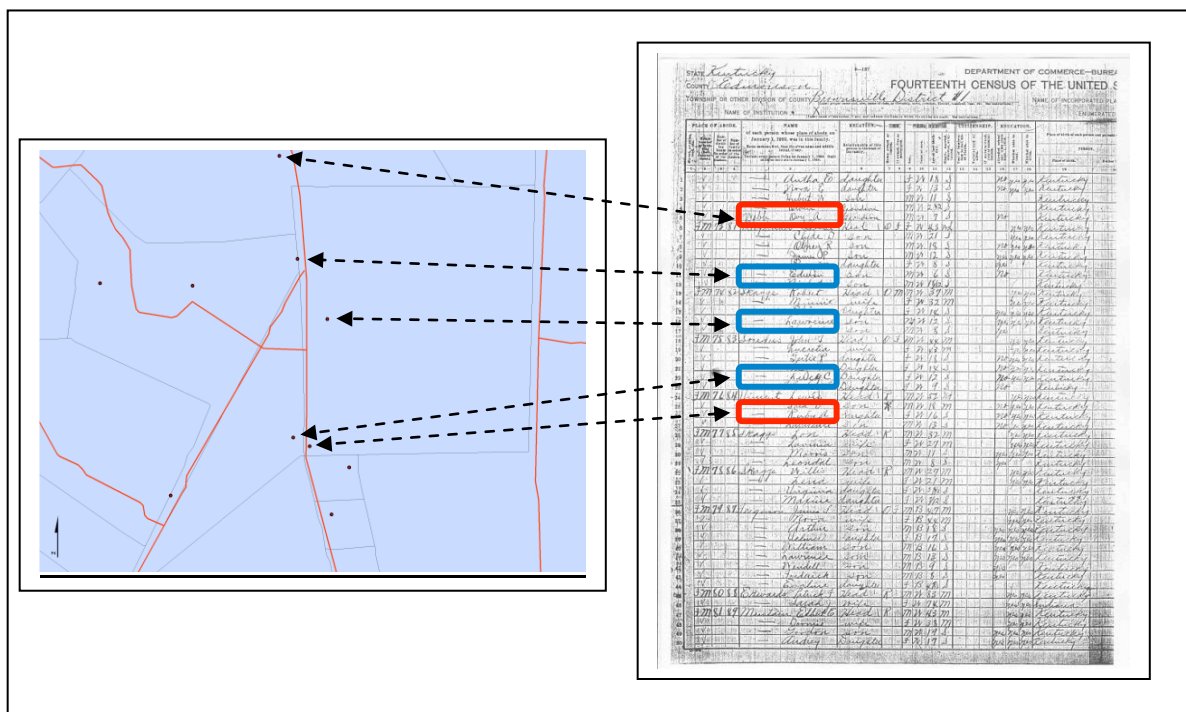


Figure 3B: Houses Interpolated from Census Order and Probable Route of Census Taker

Information was also gathered from a key informant, Norman Warnell. Mr. Warnell is a former school teacher and life-long resident of Edmonson County and a local historian by avocation. Mr. Warnell's extensive knowledge of the pre-park region was used to help place owners of households across the study area. Information from former park residents and their descendents was also used. These individuals provided a deeper knowledge of the pre-park area, and this portion of the data collection process was performed at "reunions" which took place at the Mammoth Cave Hotel. These reunions were used as a place for descendents of pre-park residents to share photographs, stories, and general genealogical information. The first of these events attended was the annual 4th of July, Mammoth Cave Reunion, held at the Mammoth Cave Hotel by descendents of the Mammoth Cave pre-park area. This event encompassed numerous families, and was

a very good source of information for this project. The second event was the Self Family Reunion, which was also held at the Mammoth Cave Hotel in September 2008. Both of these events allowed for data gathering from descendents of the pre-park area, while also building public interest in the project as a whole.

Some of the information received from these reunions was accurate, but not all. Error arose in many places, such as informants using second-hand information from older relatives, or the degradation of an informant's memory due to time. Often times, informants did in fact live within pre-park communities, but only as a very young child. This led to many of their memories of pre-park communities being passed down to them from their parents, through a type of oral tradition. Due to these problems, I was forced to investigate and weigh the accuracy of all claims in an effort to create a database that was sound.

In an article written by Alan Baker (1997), problems such as those associated with the Mammoth Cave project were discussed. The simple fact is that, with historical geography, the researcher must treat all information with some skepticism, due to the fact that no study can be better than the sources for which it is based (Baker, 1997). Since the researcher must reach into the past to find the information needed, more care must be taken so as not to unintentionally weaken the foundation of a project. Baker goes on to state:

One of the paradoxes encountered by historical geographers is that evidence about the past is both very fragmentary and extraordinarily capacious. The historical record is incomplete and, while old data can be analyzed in new ways....that record cannot be extended by the historical scientist in the way that new data can literally be generated by the natural or social scientist working in the laboratory or in the field. Our knowledge of the past will, therefore, always

be incomplete. Much of history went unrecorded and much of what was recorded in the past has not survived into the present. Historical geographers constantly encounter gaps in the data which cannot be filled empirically. [Baker, 1997, 235]

My experiences in working with the Mammoth Cave project were similar to Baker's observations. Much will remain unknown about the pre-park communities because the residents of these communities did not leave extensive written records. Although a few of the original residents are still alive, a majority of informants were not able to exactly locate their former residences due to the passage of time and natural attenuation of memory.

Assigning home owner names to former house locations through interpolation created a base for the next stage in the creation of the Mammoth Cave Historical GIS demographic analysis of households within the area that became the park. Using matched house sites, I tried to assign each household shown in the Edmonson County manuscript census as either being inside or bordering the park boundary.

Households were assigned a position relative to the park border as follows. Houses falling within each census districts were determined using the "Select By Location" tool in ArcMap™. The selected subsets of households were exported into separate feature classes for convenience. The park boundary was then sought out within the pages of the manuscript census. When a household was believed to have lived inside the park boundary, the household was highlighted within the manuscript census. These highlighted households were then indexed, in which the names, own/rent status, age, and occupations of all household members were recorded. This index allowed for a thorough analysis of all suspected park residents. Focusing on households along the outer edges of

the park boundary, a value of “definitely within” or “border” was assigned to each household.

Although there was a margin of error associated with the process of finding the park boundary within the pages of the manuscript census, this method provided a starting point for demographic analysis. The lack of geographical information within the manuscript census created uncertainty as to exactly which households resided in the area that became the park. As described above, mistakes could be made when assigning values to each household, which in turn could skew the results. Much care was taken when performing this task, as to minimize these problems, but, as with any historical research, there will always be missing pieces to the larger puzzle. An attempt to understand the extent to which the uncertainty matters was part of the demographic analysis. Using this process, a statistical analysis was finally able to be run on this area of Edmonson County. From this, the most in-depth analysis of pre-park residents was allowed, and for the first time in 89 years, a snapshot of life within this area was able to be viewed.

The demographic analysis focused on Own/Rent status, Male/Female population, occupations, and household size. This information was compared between each of the four census districts within the pre-park area. This comparison utilized basic bar graphs of raw numbers, a population pyramid, and a pie chart focusing on occupations. Pre-park area data was also compared to the 1920 census for the state of Kentucky, as well as with the U.S. as a whole. This analysis showed if the families which composed the pre-park area were unique or similar to those of the state and nation during 1920. An ANOVA test, which is used to examine the differences of means between two or more groups, was

then run to see if there were any similarities and/or differences between household sizes within the pre-park area.

A demographic analysis was also performed on the households falling within the “Definitely Within” and “Border” classification, in an effort to determine if there was any significant difference between those households. To test the validity of this information, a difference of proportions test was run on Own/Rent status and Male/Female composition for the two groups, while a difference of means test was run on the average household sizes for the two groups in question. The difference of proportion tests helped to show if the compositions, in accordance to these variables, were similar in nature. By analyzing the similarities and/or differences statistically for the pre-park area, a more solid interpretation of the raw data was obtained.

Analysis

Using household information from the 1920 Edmonson County manuscript census along with location information deduced as described in the preceding chapter, a demographic analysis was performed on what is thought to be the pre-park population of Mammoth Cave National Park.

Through interpolation of the 1920 Edmonson County manuscript census, 447 households were found to be within the park boundary, for a total population of 2,130. These numbers include the portions of four census districts that lie within the park boundary. The four districts are Beespring Census District, Brownsville Census District, Fork Census District, and Parker Census District. Out of this population, 1,113 were male and 1,017 were female. The total number of children, ages 15 and under, totaled 979 (45.9% of the total population). The total number of adults, ages 16 and above, was 1,151.

To provide a more thorough analysis of the pre-park area, a district-by-district analysis was performed. The portions of the park north of the Green River (Beespring Census District and Fork Census Districts) were more remote from the county seat of Brownsville and potential jobs there, which could have led to a demographic difference. The Beespring Census District contained only three households within the park boundary, with a total population of 23. Thus, this district is a small part of the pre-park population that is being analyzed. This district is located at the northwestern corner of the park area. Most of this particular census district was located outside of the park area, with only 0.9% of the Beespring District households inside the park. Of the 23 Beespring residents living in the area that became the park, 11 were male and 12 were female. Twelve were

adults (16 and older) and 11 were children (15 and under). This is one of the two districts that had limited access to the larger community of Brownsville and the Mammoth Cave Hotel area, due to there being few bridges spanning the Green River. This limited access would have led to minimal access to jobs as well.

The Brownsville Census District contained 34 households in the park area, with a total population of 161. Out of the entire Brownsville Census District, 10% of the total population was located within the park area. This district encompasses the town of Brownsville (which is located just outside the park boundary), and is located at the southwestern portion of the park. Of Brownsville residents living in the park area, there were 81 males and 80 females. Eighty-eight were adult (16 and older) and 73 were children (15 and under). Since this district included the county seat of Brownsville (which was not located within the park boundary), Brownsville district residents had more opportunities when it came to employment. These jobs would include government services and businesses that were concentrated in what is the county's largest town.

The Fork Census District contained 197 total households within the park area, with a total population of 1,002 (or 52% of the Fork District population). This district contains most of the park area north of the Green River. The river would have limited interaction with communities south of the river due to lack of bridges, although ferries provided some connection. Similar to the Beespring Census District, the residents of the Fork District also had limited access to employment opportunities south of the river. Out of the Fork district population residing in the park, there were 523 males and 479 females. That group included 516 adults (16 and over), and 486 children (15 and under).

The Parker Census District contained 210 total households living in the park area, with a total population of 944 (or 97% of the Parker District population). This district contains the cave entrance and the Mammoth Cave Hotel, which provided a greater variety of job opportunities than the other districts and might account for a more diversified social structure. Of the Parker residents living in the park area, there were 498 males and 446 females. That included 535 adults (16 and over), and 409 children (15 and under).

Table 1: Average Household Size by Census District

Beespring District	Brownsville District	Fork District	Parker District
7.70	4.60	5.04	4.47

To gain a better sense of the general composition of the family units within the pre-park area and to see whether there was any spatial variation in household composition within the park, the average household sizes of the pre-park census districts were examined. Table 1 shows the average household size for the portion of each census district within the study area. Three of the four census districts contained average household sizes between 4.50 and 5.04 individuals, with a park-wide average household size of 4.8. The Beespring Census District showed a larger average household size of 7.7, but it should be noted that a small part of this census district fell within the park boundary and the small number of households (three) makes a valid statistical comparison with other districts difficult. Table 2 shows the standard deviation of household size for each census district, as well as for the whole park.

Table 2: Standard Deviation, Household Size, Mammoth Cave Park Area, 1920

	Standard Deviation
Beespring Census District	2.89
Brownsville Census District	2.39
Fork Census District	2.46
Parker Census District	2.28
Whole Park Area	2.40

To test whether differences in household size between the districts were significant, an analysis of variance (ANOVA) test was performed. In its simplest form, the ANOVA test is used to examine the differences of means between two or more groups. Two assumptions are associated with this test: the standard deviations of all population groups are equal and the samples are randomly selected from the population in question (Wheeler et. al., 2004). Results are shown in Table 3. The null hypothesis was that the household sizes within the pre-park area were similar throughout the region. The analysis gave an F ratio of 3.52, with a p-value of 0.015. For the ANOVA test, the F ratio “defines the ratio of the between-group mean squares to the within-group mean squares” (McGrew and Monroe, 2000, 149), while the p-value is the “probability of getting a value of the test statistic as extreme or more extreme than that observed by chance alone, if the null hypothesis is true” (www.stats.gla.ac.uk, 1997). This allowed me to conclude that there was a 98.5% confidence level that the hypothesis was valid and that household sizes within each census district were similar.

Table 3: Household Size Analysis (ANOVA Summary Table), 1920

Source of Variation	Sum of Squares	df	Mean Squares	F Ratio	p-value
Between Group	59.09	3	19.70	3.52	0.015
Within Group	2,483.64	444	5.59		
Total	2,542.73	447			

The average household sizes found within the park area do not seem typical of an agrarian society. Larger family units were often needed to sustain family farms, as “farmers considered larger families to be an asset because children can do some of the chores” (Rubenstein, 2003, 53). With the exception of Beespring Census District (which had an average family size of 7.7), the pre-park census districts was composed of households which would only contain 1 to 3 children. Lower household sizes could be explained due to the relative location within communities located within Edmonson County. Instead of having to rely solely on crops grown on homesteads, the family units were often semi-subsistence, with some food (e.g. small gardens) being grown on family land, while also growing cash crops such as tobacco, for an income that could be used to buy other necessities which could not be produced on the homestead (such as sugar and other household goods). Many individuals within this area also had full-time off farm-employment, especially those living within close proximity to the community of Brownsville and/or the Mammoth Cave Hotel, with jobs being more diverse in these areas. The Brownsville Census District contained occupations such as foundry inspector, mail carrier, and retail merchant. These were jobs that would be more prevalent within a larger population center. The area of Parker Census District, which was home to the Mammoth Cave Hotel, contained occupations such as blacksmith, carpenter, chamber

maid, dishwasher, guide, housekeeper, laundry worker, mechanic, photographer, postmaster, salesman, servant, trustee, waiter, washwoman, water worker, and wood chopper. Many of these occupations were vital for the survival of the Mammoth Cave Hotel and showed that a variety of support staff positions provided for full-time off-farm work for many residents of this area.

The Beespring and Fork Census Districts contained a different occupational make-up, and this could be credited to the fact that these two districts were located in areas which were more remote in nature, with seclusion coming from the physical barrier of the Green River. Beespring Census District contained the occupations of asphalt worker, farmer, postmaster, and teacher. Fork Census District had a majority of residents stating their occupations were that of a farmer, with general laborer also being a plentiful occupation. These laborer positions were seasonal and full-time off-farm occupations which would be used to supplement the income of residents. This census district also contained a carpenter, mail carrier, housekeeper, servant, teacher, and timber worker. The variety of occupations which were seen within the Mammoth Cave Hotel region were non-existent in these more secluded census districts. Clear differences can be seen in the occupational compositions of the communities.

The age structure of a society is important due to the dependency ratio, “which is the number of people who are too young or too old to work, compared to the number of people in their productive years” (Rubenstein, 2003, 56). The age distribution in the pre-park communities can be seen in Figure 1. Forty-six percent of the population was age 15 or younger. Age 16 is a reasonable signifier of adulthood, because by this age a majority of individuals had completed any formal schooling and were seen as working

adults within the general population without being dependent on their parents. The number of children in this region was higher than usual for that era (1920). Aggregated census categories make age 14 the marker of adulthood at this time, so in order to compare to state and national figures, I also calculated the percentage of Mammoth Cave area population that was age 14 or younger – 44%. Statewide 35.2% of the population was 14 or younger and nation-wide 31.8% of the total population was 14 years of age or younger. In 1920, 31.8% of the U.S. population was 14 years of age or younger, a much larger percentage than are found in that age group today. This shows that the Mammoth Cave pre-park area did have a larger population of children compared to the state or national levels. The 2000 Census showed that 20.4% of the total U.S. population was 14 years of age or younger. This points to the 1920 pre-park area being in a transition phase from pre-industrial to an industrial society. In the demographic transition model, this would be a transition from Stage 2 to Stage 3. As this area moved into Stage 3, the population crude birth rate drops sharply, while the crude death rate falls at a slower rate than Stage 2 (Rubenstein, 2003, 53). Family sizes also would have started to drop slightly, a direct effect of the drop in the crude birth rate. The job markets close to towns were also more dynamic in nature, with a larger variety of skilled and semi-skilled jobs available. In the more rural areas, especially the census districts north of the Green River, the job market was less dynamic, with most employment being farming or laborer positions which would require little skill. Although in these more remote areas, skilled occupations were still available, but they were fewer in number (such as carpenter,

blacksmith, teacher, and mail carrier).

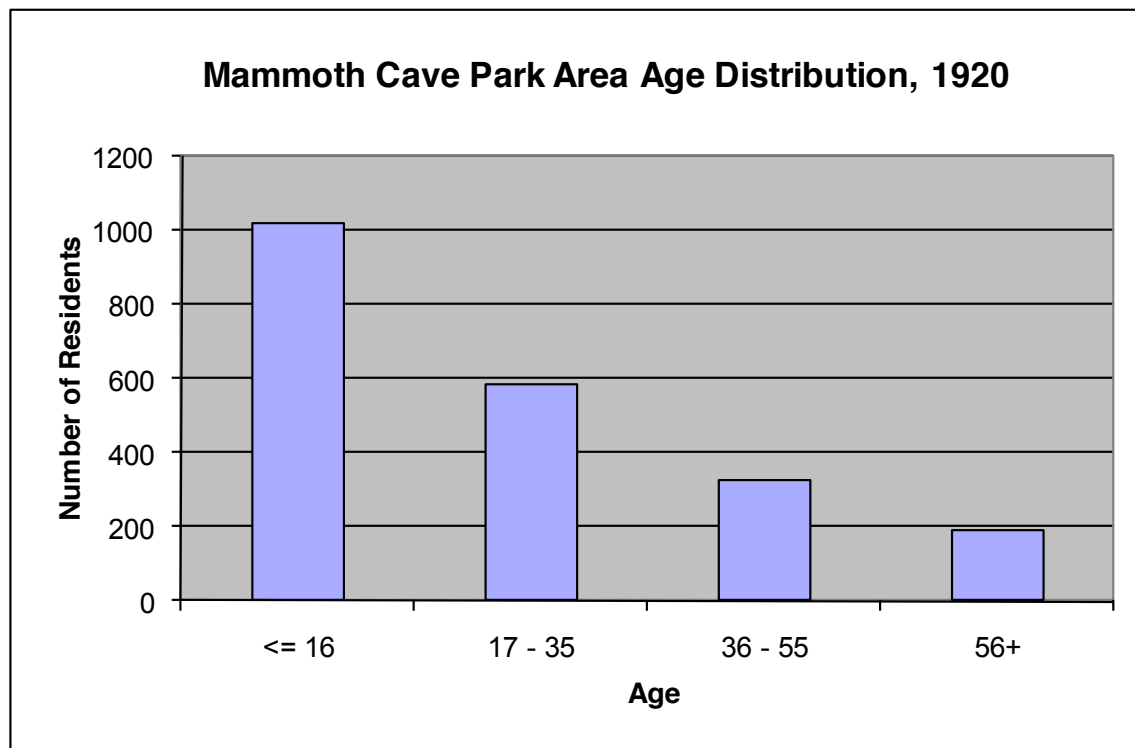


Figure 4: Mammoth Cave Park Area Age Distribution, 1920

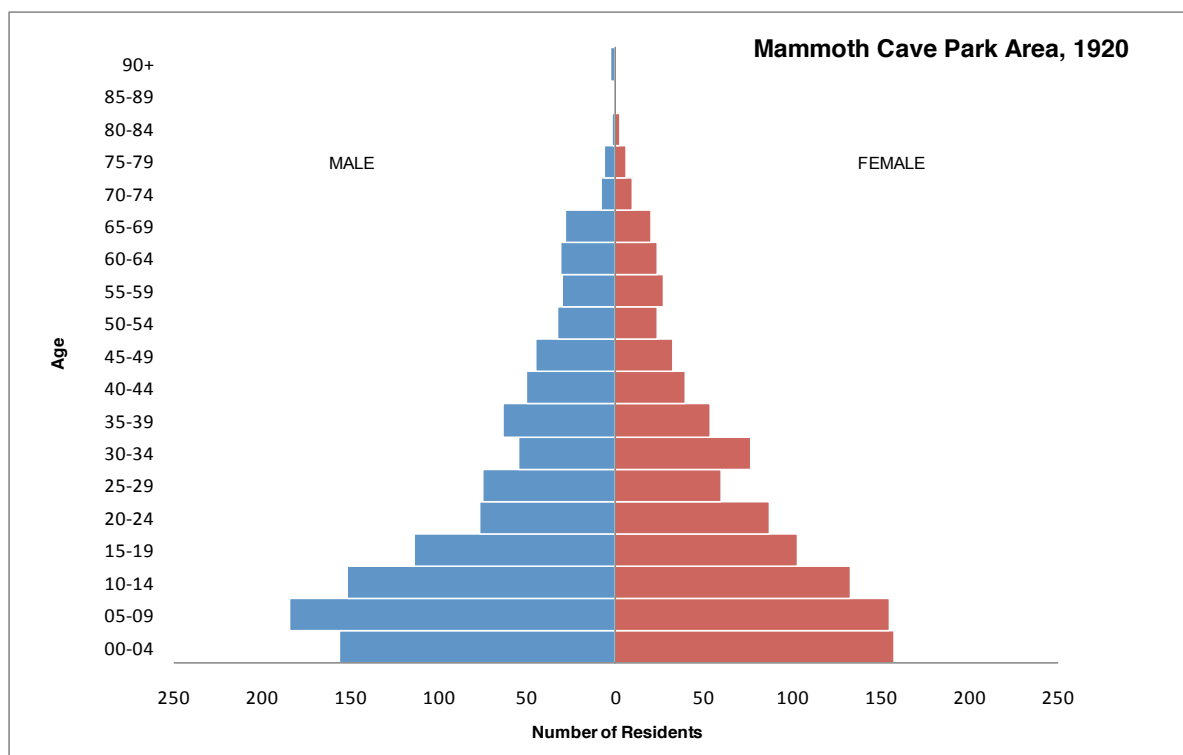


Figure 5: Mammoth Cave Park Area Population Pyramid, 1920

The population pyramid in Figure 5 shows the portion of the total population of a region or country that falls into five-year age cohorts. From the population pyramid displayed in Figure 5, it can be seen that the pre-park area contained a very large number of children, with a decrease in population in older age cohorts. When this information is applied to the demographic transition, it points to Stage 3, in which there is moderate growth throughout the population, a drop in crude birth rates, as well as a decline in the crude death rate (Rubenstein, 2003). The U.S. as a whole transitioned into Stage 3 during the early twentieth century, and the population pyramid of the Mammoth Cave pre-park area in 1920 is showing a slight transition into Stage 3 of the demographic transition due to the youngest age cohort being smaller. This would lead to family units beginning to get smaller in size, as child labor on family farms started to become less necessary.

The oldest known resident of the park area was 94 at the time of the 1920 census, but this was a rare occurrence, as there were few residents older than 70. The life expectancy for the U.S. as a whole during this time was 56.3, so the pre-park area was comparable to the nation in this respect (Kyvig, 2002).

The bulk of the population for this region was 35 years of age or younger (approximately 75% of the total population). Many of the family units within the Fork and Parker Districts were very young, and many consisted of a husband, wife, and one to four young children. From examining individual census records, I observed that there were also cases of households that included grandparents living under the same roof. Many extended family members lived within close proximity of other members of their family. It was not uncommon to find grown siblings living in adjacent houses, and this more-than-likely allowed for multiple family units to bear the responsibility of a larger

farm, and allowed for a pooling of resources. This cultural pattern still occurs in present day Kentucky.

Another variable of interest to this project was whether households within the park area owned or rented their dwellings. Understanding this is important for two reasons; emotional and economic. All of these families were displaced from this area as the park was created. This displacement forced family units to break ties with an area that, in all probability, they had been a part of since birth. Families who owned their house and land probably had a stronger sense of belonging to the area and in turn experienced more wrenching displacement. Families who owned houses were paid what was deemed fair market value for their house and land when required to move. This allowed these families and individuals to have money to buy or rent a house elsewhere. Those who were renters received nothing, and would have a harder time moving and starting over somewhere else.

As can be seen in Figure 6, a majority of families are listed as home owners. It must be recognized the census always contains the possibility of error. When the census worker was going from house to house compiling the original 1920 census, if a family was not at home at the time of his visit, the census taker would ask the nearest neighbor about the status of the family. This led to some misinformation. Another cause for error might be a head of household lying about his own/rent status to the census worker, out of pride.

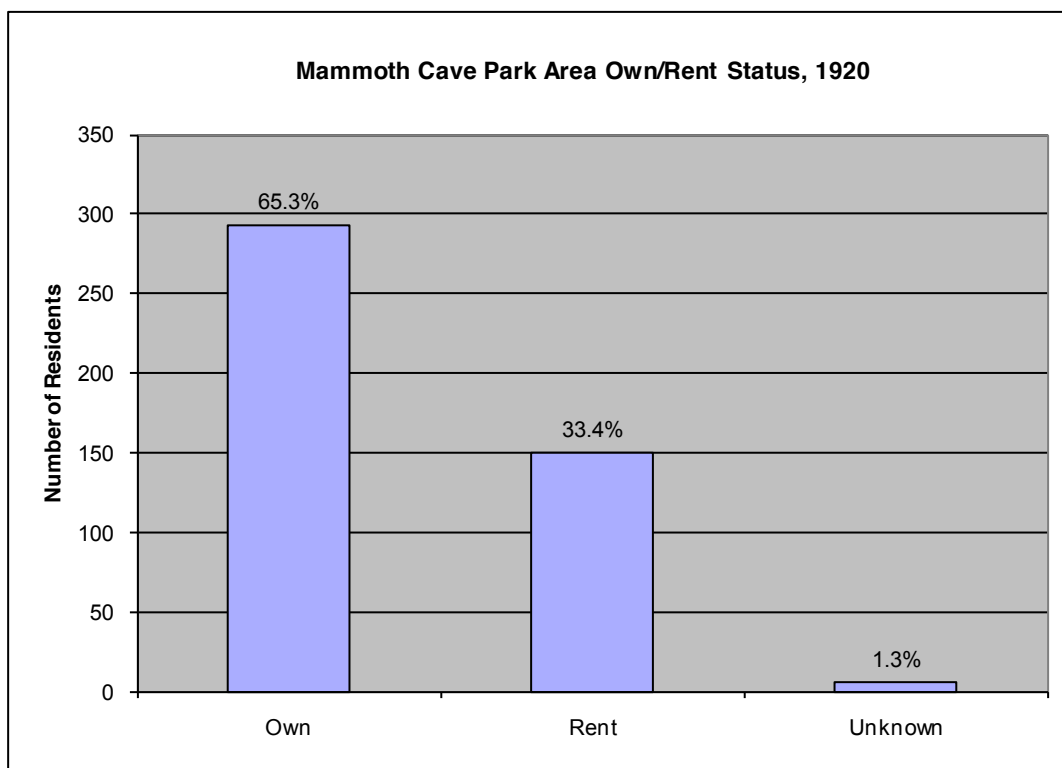


Figure 6: Mammoth Cave Park Area Own/Rent Status, 1920

The following figures (6A-D) are a comparison of the own/rent status of each census district within the pre-park study area. A small number of these households contained an unknown value within the manuscript census, possibly due to the census taker's inability to contact the head-of-household. The prominence of owners was seen in all of the census districts, often with close to double the number of owners versus renters. This finding is positive for two reasons. First, it shows that the economy in the pre-park region was stable enough to allow a majority of households to achieve home ownership. This region contained a stable economic backbone, part of which could be credited to the tourism industry which revolved around the Mammoth Cave Hotel. Not only did the hotel provide revenue for the immediate area, but it also allowed for more revenue to be fed into the county as a whole. This led to more job opportunities for those

living within the county seat of Brownsville and those areas directly affected by the Mammoth Cave Hotel. Second, the rate of home ownership is promising since it shows that a majority of families living within this region were given monetary compensation for their land when the displacement took effect. This would allow for these families to have the funds to settle down outside of the park boundary and start over. It can also be seen that the Brownsville district had a slightly higher own rate, which could be attributed to a strong economic region.

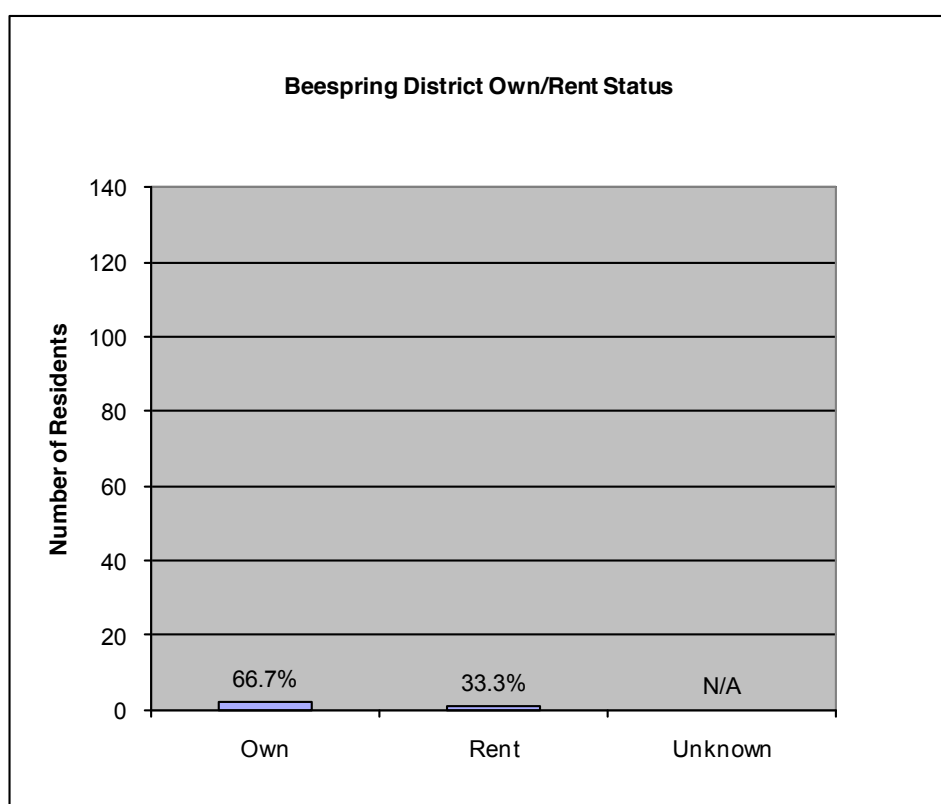


Figure 6A: Beespring District Own/Rent Status

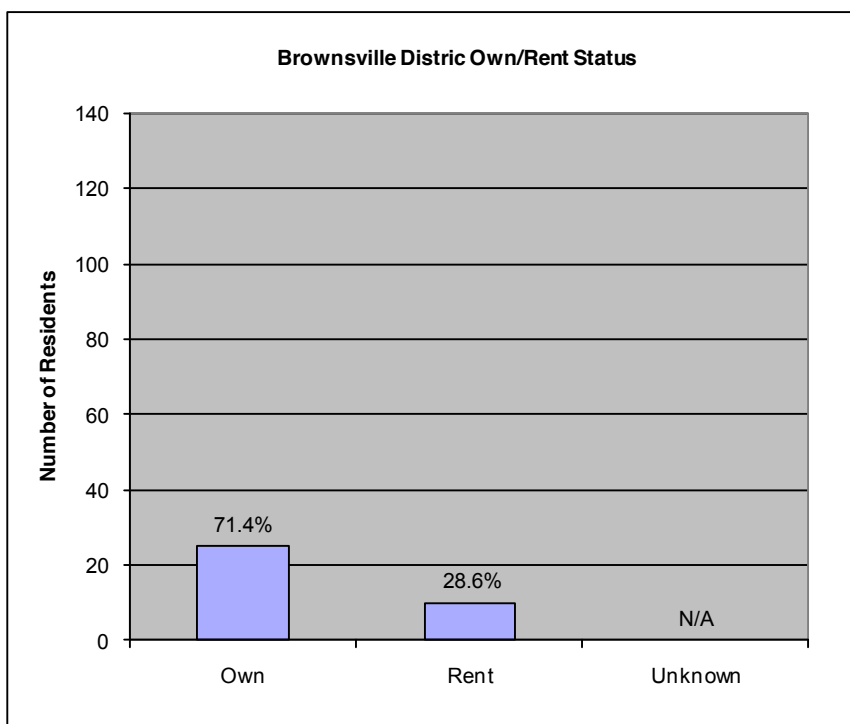


Figure 6B: Brownsville District Own/Rent Status

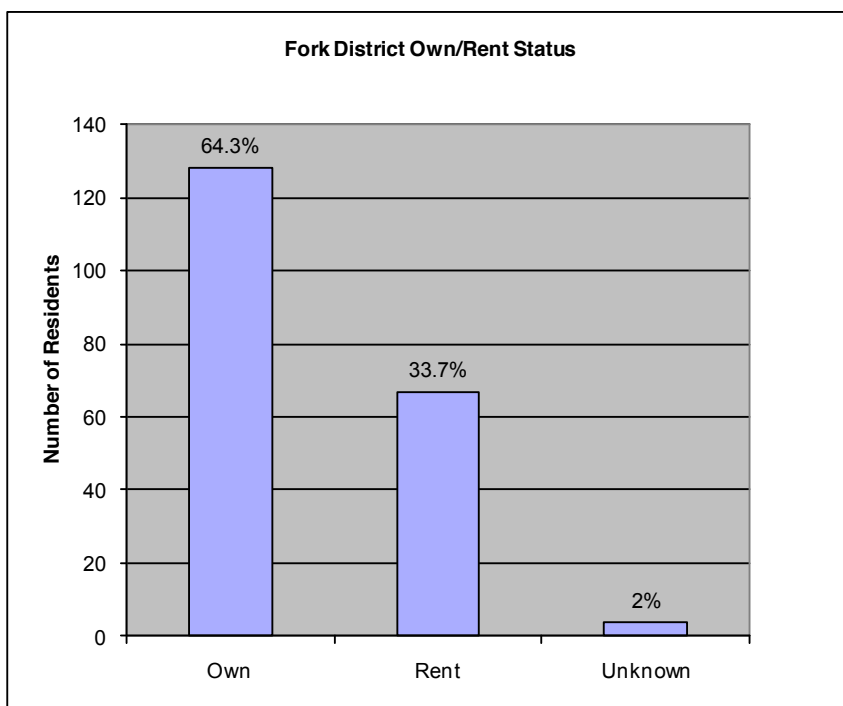


Figure 6C: Fork District Own/Rent Status

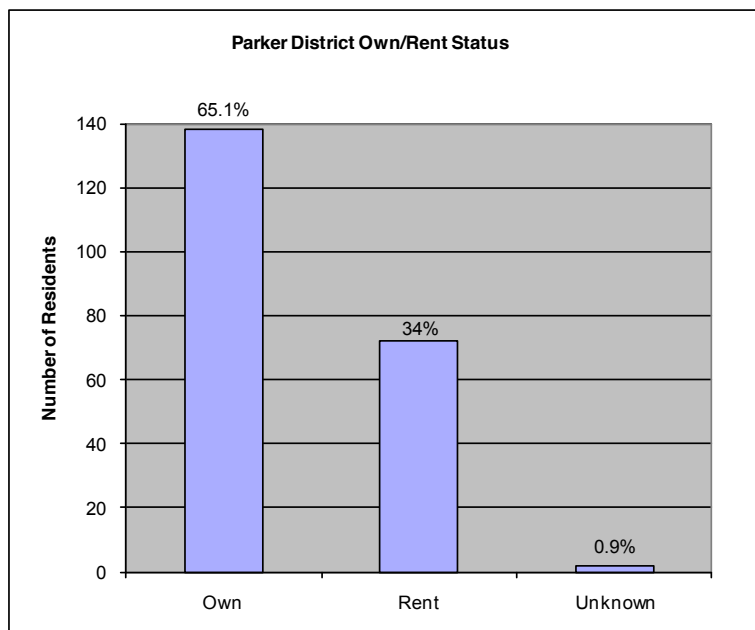


Figure 6D: Parker District Own/Rent Status

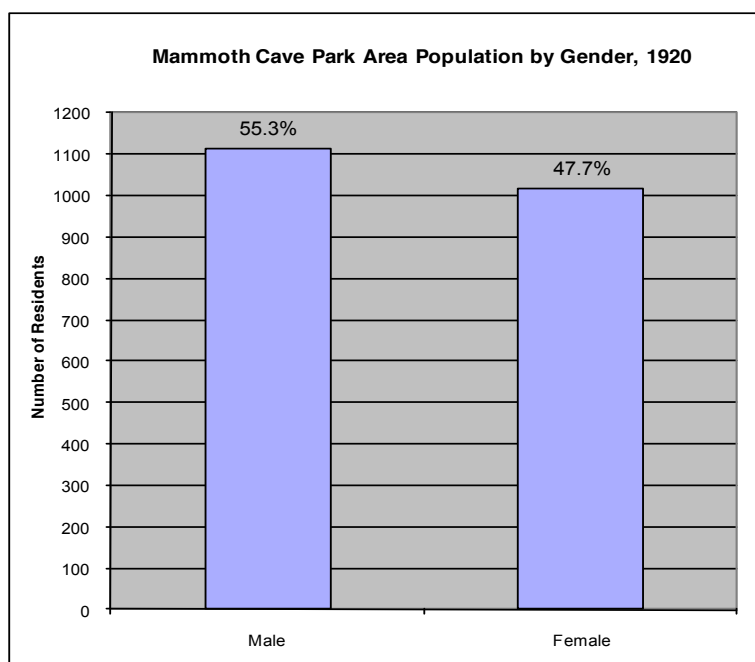


Figure 7: Mammoth Cave Area Population by Gender, 1920

The population by gender of the pre-park area also helps to show the demographic composition of the communities in question. Figure 7 shows the comparison of males to females within the pre-park region. In the pre-park society, both males and females shared the burden of a family farm. The lives for both sexes were labor intensive, unless an individual was able to obtain an education, in which case there were more career options. This was not often the case. The vast majority of the jobs listed within the census were male-dominated occupations. Farming, laborer, mail carrier, carpenter, and blacksmith were some of the jobs listed, and these jobs were found in the Beespring, Brownsville, and Fork Census Districts. The Parker Census District was the only district

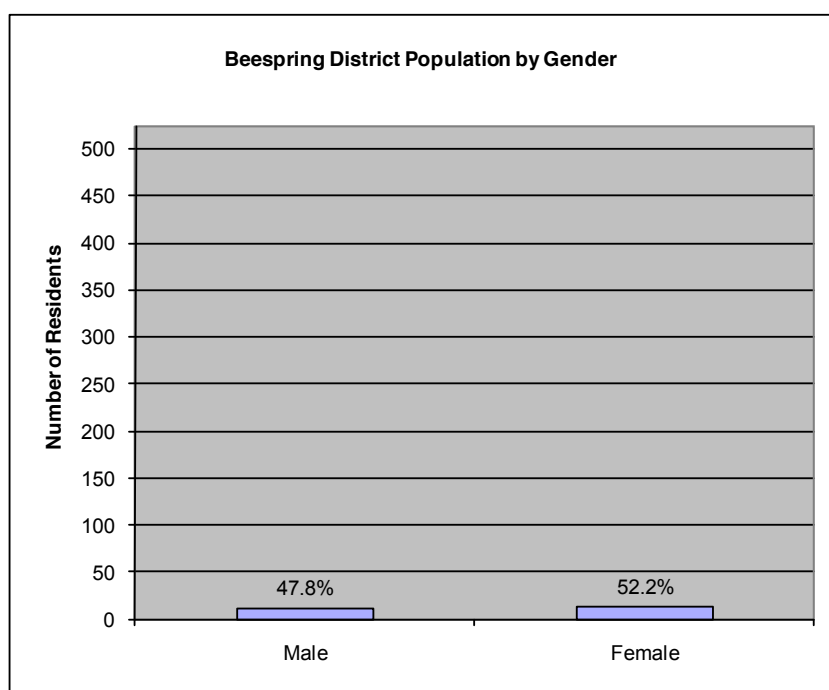


Figure 7A: Beespring District Population by Gender

which contained an abundance of jobs for women due to the existence of the Mammoth Cave Hotel. The occupations of chamber maid, dishwasher, house keeper, midwife, and washwoman

were found in this district. Given the abundance of job opportunities for women in the Parker district, we might expect to find a higher percentage of women in the population

of this region, but that does not seem to be the case. The following figures are a comparison of the sex ratio for each census district within the pre-park study area.

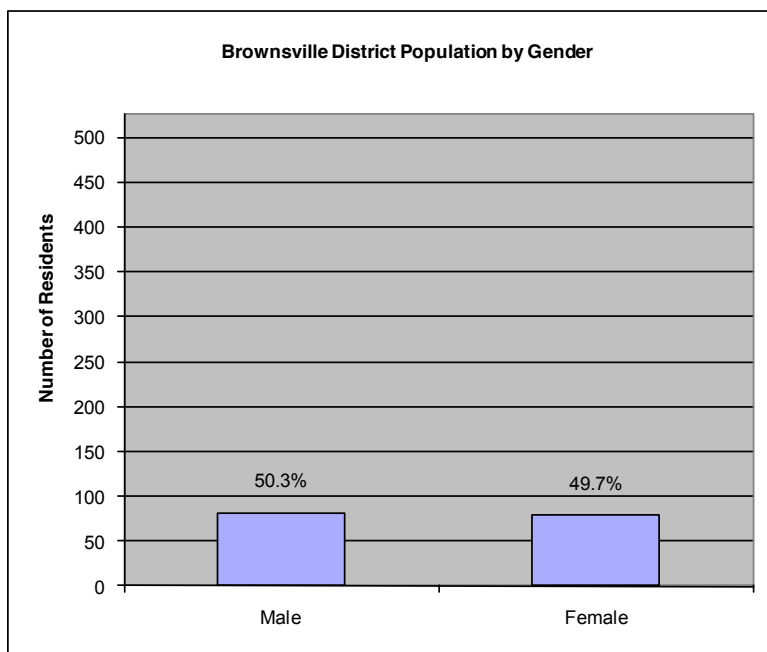


Figure 7B: Brownsville District Population by Gender

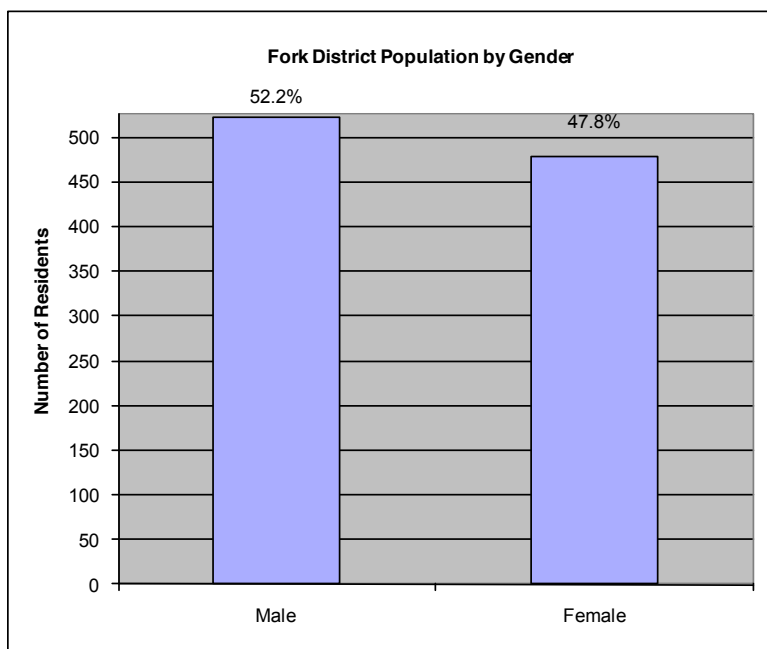


Figure 7C: Fork District Population by Gender

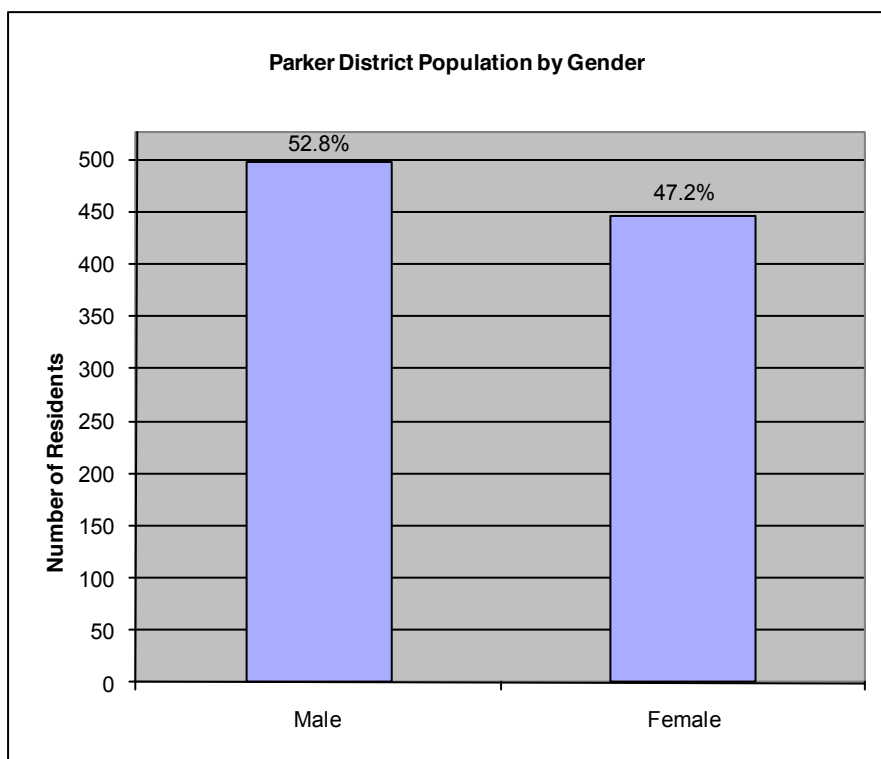


Figure 7D: Parker District Population by Gender

Men made up slightly more of the pre-park area population than women, with 52% of the population being male and 48% of the population being female. The composition of the United States during 1920 contained 51% men and 49% women. The pre-park region was very similar to the country as a whole in terms of gender ratio.

The occupations of park area residents can be seen in Figure 8. By far, the dominant occupation held by pre-park residents was farmer, while farm support occupations (laborer and manager) were also prevalent. Other occupations seen throughout the park included four carpenters and a single blacksmith, which would be expected in an early 20th century industrializing society. Within a close proximity of the Mammoth Cave Hotel was a large concentration of support staff, such as servants,

housekeepers, and guides. Table 4 provides information on occupational differences between census districts, with a focus on the occupations that are included in Figure 8.

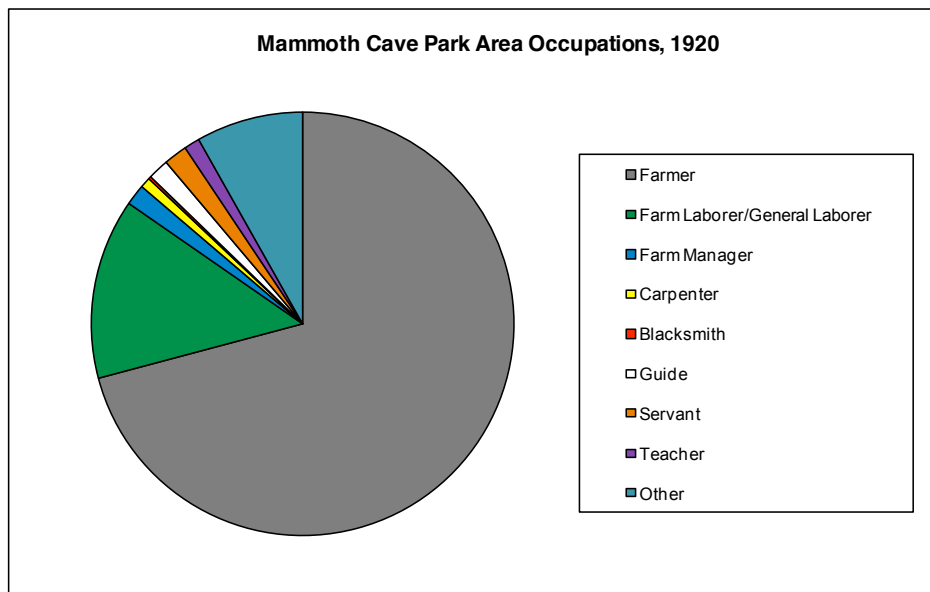


Figure 8: Mammoth Cave Park Area Occupations, 1920

Table 4: Occupation by Census District, 1920

District	Farmer	Farm Laborer/Laborer	Farm Manager	Carpenter	Blacksmith	Guide	Servant	Teacher	Other
Beespring	3	-	-	-	-	-	-	1	2
Brownsville	34	6	-	-	-	-	-	1	5
Fork	180	14	-	1	-	-	7	4	5
Parker	138	52	8	3	1	8	2	-	28

Table 5: Occupations of Mammoth Cave Park Area, 1920

Farmer	Farm Laborer/Laborer	Farm Manager	Carpenter	Blacksmith	Guide	Servant	Teacher	Other
355	69	8	4	1	8	9	6	41

The distribution of occupations from the districts was as expected when analyzing an early twentieth century society. Within each district, a majority of occupations were listed as farmers, or individuals associated with farm work (such as farm managers and laborers). Occupations listed under the category of ‘Other’ were listed as (but not limited to) mechanics, house keepers (around Mammoth Cave Hotel), mail carriers, chamber maids, dishwashers, and salesmen. A variety of hotel support staff occupations were found within the Parker District, and were concentrated within a close proximity of the Mammoth Cave Hotel.

A test designed to probe the validity of the process of selecting census households deemed to be within the park area was then run on the data. The test compared the set out households “definitely within” the park boundary with the set of households categorized as “border” households, which might or might not be in the park. The two-sample difference of proportions test compares demographic characteristics of the two groups of households. This test is necessary because there is some uncertainty in the procedure outlined in the Methodology chapter in matching census households to physical house locations. A two-sample difference of proportions test allows for inferences concerning two population proportions to be made by comparing the difference of two sample proportions (McGrew and Monroe, 2000). This test follows the assumptions that each population is larger than the sample drawn, that each sample is large enough to justify using a normal distribution, and that the samples are independent (Wheeler et. al., 2004). For this analysis, populations were tested rather than samples. This test was run to test the similarity of the households that were known to be located within the park area with those households that might possibly be located within the park

area. There was some uncertainty about which households did lie within the park area, so running a two-sample difference of proportions test helped to show whether there was any difference between these two groups (Table 6). If no difference is found, then the uncertainty about household location relative to the park boundary is of no importance and we can have increased confidence in the validity of the demographic analysis.

Table 6: Difference of Proportions Results for Mammoth Cave Park Area, 1920

	Own/Rent	Male/Female
P_1	64.0%	52.4%
P_2	81.3%	49.1%
Z Score	-1.97	.786
P-Value	0.0488	0.4319

Table 7: Difference of Means Results for Mammoth Cave Park Area, 1920

	Average Household Size
X_1	4.7
X_2	5.0
Z Score	-0.654
P-Value	0.513

I found 420 households (or 1,985 individuals) that resided within the park area, and 32 households (or 161 residents) possibly within the park area (referred to as the “Border” group). Using household location data from the GIS, all households that were located within one mile of the park boundary were selected as households that were possibly within the park area, while the remainder of the households were listed as definitely within the park area. Through the construction of the GIS, the homeowners for

these households within one mile of the park boundary had been questionable as to whether they were located within the park area or just outside the park area. The proportions of house owners vs. renters were not similar for the park and border areas, as 64% of residents within the park owned their house, while 81% of residents near the park border area were home owners. With a p-value of 0.0488, it was shown that there was a statistically significant difference for the two groups of owners vs. renters. This suggests that Edmonson County residents who lived within the area that became the park were less likely to be home owners than their neighbors in the immediately surrounding area, and thus more families did not receive any monetary compensation for the home and land for which they resided than if the park had been put elsewhere. When these families did start over outside of the park area, they would have been economically disadvantaged. This could have caused a more traumatic experience for these families, engendering resentment and hard feelings, a situation that would help to fuel collective memory of the communities that were left behind.

Analysis of population by gender showed that both groups were similar in composition, with 52.4% of the “Definitely Within” group being males, while 49.1% of the residents falling within the “Border” group being males. This finding helps to show that, although rates of home ownership differed demographically, residents located within the park area were very similar to those along the border area of the park. This suggests that the demographic composition of the Mammoth Cave park area, circa 1920, was similar to the immediate areas surrounding the park. To further examine demographic similarities and differences, a final analysis, a difference of means test was performed on average household sizes for the two groups (Table 5). The difference of means test is

used to compare and test means from two independent samples for significant differences which assumes a normal distribution (McGrew and Monroe, 2000).

From this examination, it showed that there was no significant difference in the household composition of these two groups. Those households that definitely fell within the park had an average household size of 4.7, while the households that fell within the “Border” group had an average household size of 5. This helped to show that even though the owner/renter status of households were significantly different for the two groups in question, the household sizes for the two groups was consistent. These findings help to support the ANOVA test, and shows that the demographic composition of the park area was similar in nature to that of the surrounding area.

From this analysis of the pre-park region, it was shown that this region was greatly influenced by three factors. The first factor is the Mammoth Cave Hotel, whose tourism industry helped to bring both jobs and revenue into the Parker Census District. As was shown in the census data for occupation, more job opportunities were present in and around the Mammoth Cave Hotel area. The second was the area around the county seat of Brownsville. Similar to the Mammoth Cave Hotel, a richer source of jobs was shown. Residents of the pre-park region who lived in close proximity of Brownsville had more opportunities when it came to employment, and were also given the advantages that would come with living close to a county seat. The third factor was the cultural and employment seclusion that was caused by the Green River. Residents living within the Beespring and Fork Census Districts had fewer employment opportunities. Even though these two districts were more isolated, they were still similar in the amount of home owners/renters and male/female composition as the other two districts.

The ANOVA test showed that all of the census districts were similar in household size, despite the isolating potential of the Green River. When compared to the nation as a whole during this time, it was shown that the pre-park region was similar in nature, with some minor differences, such as a large, younger population.

Statistical testing aimed at determining the validity of the above demographic analysis compared two groups of households; those households that were within the park area and those that were border households. From the difference of means analysis, those households that fell within the park boundary were very similar to those that were along the border for male/female composition and average household size. The difference of proportions test showed that park residents were more likely to rent their houses than people along the outer edges of the park. Even though the owner/renter composition did not show similarities with the areas immediately outside of the park boundary, other demographic indicators throughout the park were very similar. When compared to the households along the outer boundary, and immediately outside of the pre-park area, the demographic composition of the families remained the same. This helped to show that even though the process used to assign census households to physical house locations made some assumptions and had some sources of error, the demographic analysis performed, with the exception of homeownership, is relevant and valid.

Conclusions

Through the use of demographic and statistical analysis, a better understanding of the Mammoth Cave pre-park area during 1920 has been gained. Although national parks have often been portrayed as areas uninhabited by humans, this research has shown that this was not always true, especially with national parks created within the eastern portions of the United States. Mammoth Cave may now be a pristine wilderness, but at one time this area was populated with numerous communities. Each one of these communities had a sense of identity, and it is this identity that can still be found expressed and fostered at annual homecomings and family reunions. These activities help to sustain public memory of the seemingly lost and almost forgotten stories tied to this region.

Starting with the exploration of the pre-park area by hunting parties in the late 18th century, families started to slowly populate the region that would one day become Mammoth Cave National Park. The displacement of these residents has often been overlooked, but by understanding these residents, Kentuckians and tourists/outsideers alike can construct a more meaningful history of this area, while also bringing awareness to the emotional and economic impact that such a displacement brought about (both positive and negative). The Mammoth Cave Hotel helped to bring tourism to Edmonson County, a fact that still holds true today. Due to the limitations in transportation during the 1920s, support staff would have lived within close proximity to the hotel, and this would have helped to spur some economic development for the county as a whole.

As the displacement of residents was carried out, the personal sacrifice of these residents could be seen. For some, such as landowners, monetary compensation was given which allowed for them to start over more easily than renters, who would have lost their homes without receiving any compensation. This would have caused a financial and emotional strain on these individuals and families, as they were being forced to start over completely without any financial assistance. The impact of forced relocation works as a catalyst to cultivate and promote public memory of regions such as the pre-park area.

As part of this project, a Historical Geographic Information System (HGIS) was created for the 1920 Mammoth Cave pre-park area. The HGIS was used as a central location in which census information, publicly supplied information, and demographic information was stored. From this central location, an analysis of the construction of these communities, which called the pre-park area home, could be performed. Building the HGIS entailed the creation of a methodology for converting manuscript census data into a GIS format. This methodology helped to produce an index of the entire Edmonson County 1920 manuscript census, and coupled with information gathered from the public, a more complete dataset of household information was created for the pre-park area. It is this information that was used to perform all statistical analyses on the 1920 Mammoth Cave park area.

Through the statistical analysis of the families which resided within the 1920 pre-park area, this study shows that these families were similar across the entire park, and shared traits with those families that lived around the arbitrary boundary that would encompass Mammoth Cave National Park. Portions of the Beespring, Brownsville, Fork,

and Parker Census Districts constructed what was the 1920 Mammoth Cave area. Family size and male/female composition of the pre-park area were similar throughout the region. These families often worked seasonal, off-the-farm jobs while also relying on family farms to help support themselves. The communities were typical of early 20th century, rural America communities, such as being centered around churches and schools. The usual amenities were also present, such as general stores, blacksmiths, and carpenters. The employment opportunities throughout the pre-park area were also very similar, with the exception of the area surrounding the Mammoth Cave Hotel. Here more support staff roles were found, including a number of jobs for women, along with the usual occupations found in the remaining pre-park area. From this analysis a foundation was created which will allow for future projects to be built.

Future Work

Using the information gathered in this project, an online interactive website will be created to allow descendents of pre-park communities to submit information, in the form of photographs, audio interviews, and written documents, to be available for public consumption. All information used for this project will be available online for the public, which stems from the demand shown by descendents of these pre-park communities. From the start of this project, information has been shared both ways: from Western Kentucky University students and faculty taking part in this project, to the public who shows interest in sustaining and expanding this project, back to those involved at Western Kentucky University. This project has and always will be an open exchange of information, which helps to serve all of those involved. Using the public as a source of

information will also allow for previously unseen information to be brought to the attention of researchers. As more information is collected and analyzed, a much better understanding of the pre-park area will be possible.

At a later date it will also be possible to perform an analysis on the pre-park area during different stages of development, opposed to just the 1920 Census as in this research project. Since a methodology is in place for transferring manuscript census data into a GIS, this will allow future researchers to analyze data from the 1910 and 1930 census, as well as 1920 census data for Barren County, Kentucky (which contains a portion of Mammoth Cave National Park). This will lead to a much more comprehensive analysis of the demographic changes that occurred before, during, and after the forced relocation of the pre-park area.

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